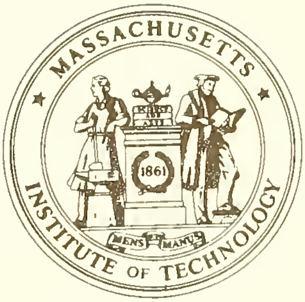

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by

Robert F. Engle

Number 119

November 1973

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This research was supported jointly by a grant from the Ford Foundation and National Science Foundation Grant GS 37010X and was completed while the author was on leave at Cornell University. Most of the data was gathered under the auspices of the Boston Redevelopment Authority; the author is indebted to Alex Ganz and John Avault for this assistance and advice, to his colleagues F.M. Fisher, J. Rothenberg and J. Harris for helpful discussions, and to numerous graduate students who cheerfully undertook the multitude of computer and data gathering chores.

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1. Introduction and Summary

The property tax system is well known to be an inequitable and regressive form of taxation. In this paper we argue that this is a natural consequence of the failure to maintain a fixed relationship between assessments and sales prices over time; and, that as property taxes rise, these inequitities will become more severe. To investigate the response of assessments to changes in property values, a series of spatially disaggregated time series indices of both assessments and property values were specially constructed for the city of Boston. These indicate an almost complete failure to adjust assessments to changing property values and consequently a shift of the tax burden from economically viable communities to those with slow rates of change of property values. We call this de facto discrimination.

Previous studies of assessment sales ratios in Boston [5], [2], have concluded that there are great differences between different property types, value classes and neighborhoods. A variety of explanations are proposed including different mixes of structures in different neighborhoods, implicit "benefit" calculations by the assessors, political influences, and lagging response of assessments to changes in sales prices. Because of the essentially cross-sectional nature of both of these studies, it was not possible to fully evaluate the effects of price changes on assessments.

In section 2 we discuss the equity implications of lagging assessments; section 3 describes the data and construction of the indices; and section 4 presents the results and tests of the hypothesis.

2. Equity Effects of Lagging Assessments

If assessments do not change when property values change, then the assessment sales ratios will fall in areas with rapid price increases. Since the nominal tax rate is the same for all communities within a local government jurisdiction, the tax payment as a proportion of property value will decline relatively in prosperous communities. Thus a failure to adjust assessments swiftly and accurately will lead to a shift in the tax burden toward depressed areas. The practice[1] of reassessing after each sale does not eliminate the problem and clearly introduces new economic difficulties such as impediments to mobility.

The shift in the tax rate which results from changes in land values is exacerbated by subsequent shifts in the demand for land. The lower the tax rate, the greater the demand for land and the faster the price will be bid up. This effect tends to shift even further the burden of the tax onto the less viable communities. To discover the magnitude of this effect, the elasticities of demand with respect to tax rates must be ascertained. This paper is a part of a major study [3] of intrametropolitan location which will examine this question and many others relating to the whole Boston SMSA. However, under simple assumptions, we can explore theoretically the effects of changing tax rates upon land values and equity.

In a comparative static framework, let us consider the housing market to be a perfect market where landlords buy properties under static expectations with a fixed discount rate. The price of a parcel would then be

$$P = (R-T)/i \tag{1}$$

where R is the annual rental, T is the tax payment and i is the interest rate. The effecitve tax rate is

$$t = T/P \tag{2}$$

---

[1] This is not done in Boston although it is practiced by some of the suburban towns such as Cambridge.

We now consider the effect on t of a once and for all change in R which may be thought of as changing the desirability of the parcel, possibly through the provision of public services. As only one parcel is to be changed, there will be no effect on the total municipal revenues.

In the simplest case where the tax payment is fixed but does not enter into the capitalization of price, the elasticity of t with respect to R is minus one. When taxes are fully capitalized[2] but assessments and therefore tax payments are not a function of price, the elasticity is

$$(3) \qquad e = -1/(1-T/R)$$

so that if taxes are a large share of rentals, this elasticity becomes very large and negative suggesting an important shift of the tax burden away from properties with rising rental values toward those with declining rentals.

Even if assessments and therefore taxes respond partially to price, this elasticity may be large and negative. Suppose the elasticity of assessments with respect to prices is σ, then (3) becomes merely

$$(4) \qquad e = -\frac{(1-\sigma)}{1-(1-\sigma)T/R}$$

so that for $\sigma=0$ we have the previous result and for $\sigma=1$ we have a zero elasticity as required by tax law and equity considerations.

This relation, however, may still understate the effects of lagging assessments upon the distribution of the tax burden. If the landlords have expectations of capital gains on their properties, then these may lead to further shifts in the price levels in the same direction and this tertiary dynamic effect will lead to a still more unequal distribution of taxes.

This simple analysis indicates that a failure of assessments to fully adjust to changes in market values may lead to highly unequal tax liabilities. This may be an important explanation for the well-known regressiveness of the property tax and is partial explanation for the emergence of urban depressed areas as property tax rates soar. Thus, *de facto* discrimination in residential assessments is a natural consequence of even a minor failure of assessments to keep pace with property values.

---

[2] See Oates [4] for evidence that taxes are largely capitalized rather than being shifted to renters.

3. Methodology

Constructing indices of either assessments or prices, generally requires good data on attributes of the structures in the sample. To avoid this difficulty we employed a method described by Bailey, Muth and Nourse, [1]. This method is based upon the fact that when one property is sold twice, it is known that its basic attributes are the same. If the price of the ith property is determined by its attributes A_i and by the time period in which it is sold, then we might write:

$$(5) \qquad p_{it} = A_i B_t e^{u_{it}}$$

where B_t is an index describing the change in value of all the properties the neighborhood and u is an error term. Taking logs and subtracting the observation of the price in another period, t', when the same property is sold, we have:

$$(6) \qquad \log(p_{it}/p_{it'}) = b_t - b_{t'} + u_{it} - u_{it'}$$

where b=log(B). Under reasonable assumptions on the disturbances, (6) should be estimated using least squares where the right hand side is a row of zeroes except for the t and t' elements which are respectively +1 and -1, and there is an observation for each i. This equation can be fitted for sales, assessments or their ratio.

There are several assumptions implicit in specification (5). First, we assume that all value classes and property types in the neighborhood experience the same rate of growth of prices although of course there is no need for the price levels to be the same. This assumption is testable and in several cases we ran Chow tests to determine whether the indices for different property types or value classes were significantly different. The results almost always indicated no significant differences. Second, we assume that the structure is unchanged between sales. This can cause a serious bias to the indices if there is substantial upgrading or deterioration of the property. No properties were included which showed a change of use or number of units between sales. Nevertheless, there is some bias in the estimates and we therefore interpret the indices as the price change which a "typical" unit would experience. As far as the assessment sales ratios are concerned, however, there is no bias since the assessments in principle should be similarly increased. Third, we must assume that a sample of properties which are sold twice is a random sample of the population. This is only slightly more restrictive than using a sample of properties sold once since our sample period is so long.

Indices were constructed for each of the 14 Boston Redevelopment Authority defined planning districts within the city. The data were taken from state tax stamps afixed to the deed at the time of sale and recorded by the Metropolitan Mortgage Bureau. In addition, the current assessment, structure type, address and date were recorded. Only properties with all of this information at two points of time in the sample period were used. In addition, in order to obtain a geographically dispersed sample, properties on each street were taken in proportion to the number of addresses on that street which lay in the district. This procedure was supplemented at random geographically in order to obtain at least 10 sales per year if there were that many in the district. Thus the sample is intended to be uniform both geographically and over the time period.

4. Results

The indices for assessments and for sales for each of the 14 planning districts and a combined index for all Boston are tabulated in the appendix. The index for the assessment sales ratio is merely the ratio of the separate indices. With 1946=100, the index in 1971 gives the proportional increase in current dollars of land values and assessments over the 25 years. Estimates of these measures of total change are presented in Table 1.

TABLE 1

Assessment and Sales Indices 1971, 1946 = 100*

District	Assessment	Sales	Assessment/Sales
East Boston	108.4	382.5	28.4
Charlestown	99.2	618.0	16.1
South Boston	107.5	347.0	31.0
Central/North End	142.7	554.5	25.7
Back Bay/Beacon Hill	148.9	498.3	29.9
South End	121.0	490.9	24.7
Fenway Kenmore	135.6	532.2	25.5
Allston/Brighton	111.4	350.7	31.8
Jamaica Plain	99.7	296.6	33.6
Washington Park	86.0	217.4	39.6
Roslindale	102.6	328.5	31.2
West Roxbury	111.4	317.5	35.1
Hyde Park	111.3	299.6	37.1
Dorchester	102.7	257.1	40.0
All Boston	110.3	357.1	32.4

*Geometric average of indices for 1970, 1971, 1972 minimizes local fluctuations due to multicollinearity in estimation, and will not produce bias if the growth rate is approximately constant over the period.

While property values went up five or six times in some communities, the assessment index nowhere increased by more than 50% over the entire 25 years. Even the commodities component of the CPI, a measure of alternative goods, has increased by about 62% over the last 25 years and thus assessments have fallen in real terms in every community. If assessments were equitable in 1946, the third column indicates the magnitude of the 1971 inequity. The difference between the most and least favored district is a factor of three.

To estimate the elasticity of assessments with respect to property values, we regressed the log of the assessment index upon the log of the price index for the 14 districts. This is an estimate of the long run change in assessments which results from a given change in prices and is therefore an estimate of σ in equation (4). The estimated elasticity was .331 with a standard error of .102. While this is certainly different from zero, it is far from unity. To investigate the possibility that the adjustment was not uniform over the period, the same procedure was followed for the first 15 years and the last ten. The elasticities were .331 and .155 with standard errors of .123 and .075 respectively, and therefore the responsiveness of assessments is, if anything, less now than in the past.

To examine statistically the proposition that assessments do not change at all, we can construct an F test of the hypothesis that all the coefficients in (2) are zero. This is not exactly the F printed from the regression since that assumes that there is a constant. Letting $I^2=1-e'e/y'y$ where e is the vector of residuals from (2) and y is the dependent variable, we compute the statistic

$$F = (I^2/1-I^2)(N-K)/K$$

which is distributed as $F_{K,N-K}$ under the null hypothesis. These F statistics are presented in table II.

Table II

F-Tests for No Change

District	F Price	F Assess
East Boston	13.83	1.493
Charlestown	9.96	0.851
South Boston	12.39	1.591
Central/North End	9.13	1.607
Back Bay/Beacon Hill	16.33	4.824
South End	14.47	2.198
Fenway/Kenmore	9.06	2.736
Allston/Brighton	32.38	1.047
Jamaica Plain	10.03	1.336
Washington Park	3.22	2.365
Dorchester	11.64	1.733
Roslindale	29.06	1.589
West Roxbury	30.79	3.288
Hyde Park	32.52	2.866
All Boston 14 District Data		

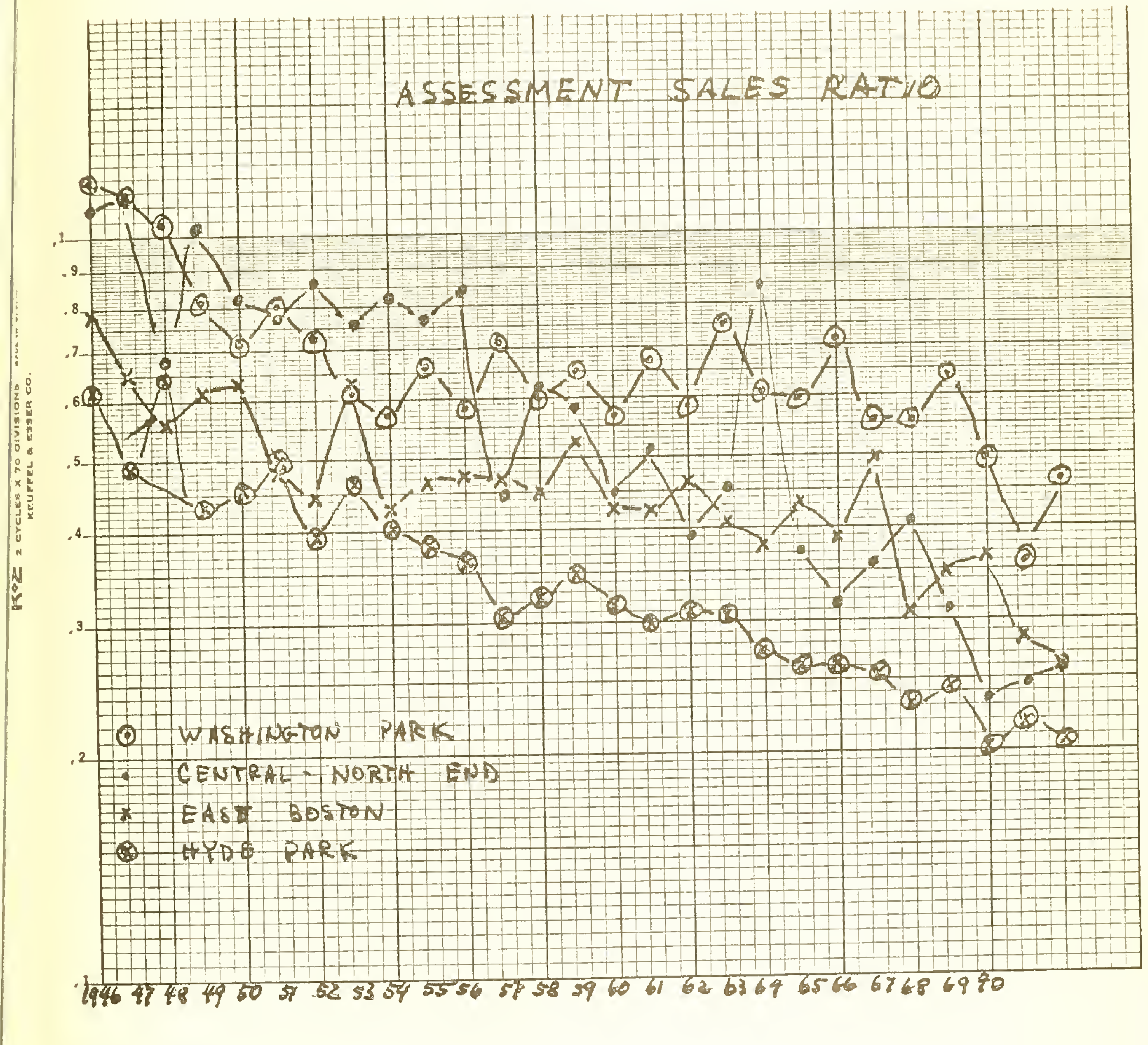
ASSESSMENT SALES RATIO
1
.9
.8
.7
.6
.5
.4
.3
.2
.1
1946 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70
WASHINGTON PARK
CENTRAL - NORTH END
EAST BOSTON
HYDE PARK
K+E 2 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.

FIGURE 1

The 99% point of the F distribution is 1.95 so we are easily certain that prices have changed over the sample period. However, for only 6 of the 14 indices can we be 99% sure that assessments have changed in any but a random way in 26 years.

In order to compare our results with those of other investigations we computed raw assessment sales ratios for each district and for each year, ignoring the information that the data come from paired sales. From this calculation we obtain levels, not merely rates of change. The results are again tabulated in the appendix, and where comparable, are in close agreement with the residential figures of Oldman and Aaron. Several of the series are plotted in figure 1. The interpretation of these figures is more difficult than the indices because the mix of types of residential structures will alter the averages if not all types are assessed equally. If we overlook this difficulty, then these ratios will give a clear indication of differential burdens.

The broad pattern of these results indicates that at the beginning of the sample period, the central city districts had the highest assessments while the more suburban areas such as West Roxbury, Hyde Park and Roslindale had low ratios. The intermediate dense, ethnic neighborhoods of South Boston, East Boston, Dorchester, and Jamaica Plain originally had assessment ratios between these extremes. However, over time, the growth of prices in the central districts was so rapid that in the early sixties, they passed the intermediate neighborhoods which were growing more slowly. By 1970, these districts had almost reached the levels of the suburban districts and had far outstripped the intermediate neighborhoods. The area which has suffered the most is Washington Park (which is Boston's ghetto) where assessments began at a high, center-city level; but, because of the failure of prices to rise, assessment sales ratios never fell to the levels of the other districts. In 1970 the ratio is 50% higher than in any other district. These results are based on rather few observations per figure, nevertheless, they indicate a substantial disparity, and confirm the important effect of changing price levels while assessments remain stationary.

APPENDIX A

PRICE INDICES

	East Boston (Dist. 1)	Charles-town (Dist. 2)	South Boston (Dist. 3)	Central/ North End (Dist. 4)	Back Bay/ Beacon Hill (Dist. 5)	South End (Dist. 6)	Fenway/ Kenmore (Dist. 7)	Allston/ Brighton (Dist. 8)
1946	1.	1.	1.	1.	1.	1.	1.	1.
47	1.175	1.575	.916	1.094	1.123	1.257	1.145	1.155
48	1.367	1.522	1.201	1.601	1.313	1.563	1.300	1.308
49	1.369	1.523	1.330	1.410	1.411	1.161	1.251	1.153
50	1.328	1.129	1.268	1.582	1.397	1.493	1.307	1.434
51	1.545	1.734	1.357	1.521	1.577	1.685	1.504	1.452
52	1.672	1.775	1.410	2.027	1.788	1.581	1.293	1.589
53	1.583	2.035	1.512	1.551	1.447	1.610	1.378	1.428
54	1.939	2.240	1.444	1.690	1.763	1.570	1.504	1.596
55	1.599	1.972	1.604	1.610	1.610	1.772	1.903	1.559
56	1.700	1.813	1.604	1.388	1.744	1.429	1.491	1.732
57	1.865	1.725	1.588	2.001	1.717	1.374	1.578	1.769
58	1.896	2.301	1.849	1.913	1.638	1.758	1.586	1.884
59	1.866	2.043	2.068	2.703	2.073	1.592	2.017	1.968
60	1.702	1.848	1.689	2.153	2.298	1.415	2.146	1.984
61	2.191	2.168	2.123	2.916	2.139	1.656	2.047	2.010
62	1.916	2.302	1.875	2.824	2.882	1.414	2.230	2.063
63	2.243	2.497	2.254	2.198	2.858	1.542	2.890	2.172
64	2.477	2.689	2.378	2.344	3.151	1.812	3.141	2.421
65	2.701	2.867	2.274	3.164	3.481	2.354	3.698	2.594
66	2.616	3.662	2.544	3.463	3.462	2.619	3.200	2.581
67	2.384	3,041	2.507	3.826	4.054	3.081	3.519	2.406
68	2.924	3.676	2.886	3.619	4.188	3.211	3.682	2.774
69	2.792	4.156	3.159	3.860	4.458	3.981	4.112	3.190
70	3.507	6.593	3.129	6.113	5.266	4.854	4.545	3.423
71	3.790	4.978	3.450	4.417	4.869	4.730	5.944	3.359
72	4.210	7.191	3.872	6.314	4.825	5.152	5.579	3.752

PRICE INDICES

	Jamaica Plain (Dist. 9)	Washington Park (Dist. 10)	Roslindale (Dist. 12)	West Roxbury (Dist. 13)	Hyde Park (Dist. 14)	Dorchester (Dist. 11)	All Boston
1946	1.	1.	1.	1.	1.	1.	1.000
47	1.274	1.085	1.169	1.267	1.210	1.182	1.168
48	1.393	1.162	1.276	1.304	1.158	1.390	1.340
49	1.529	1.302	1.167	1.120	1.240	1.407	1.315
50	1.491	1.445	1.309	1.261	1.270	1.356	1.383
51	1.634	1.494	1.311	1.287	1.360	1.423	1.490
52	1.379	1.808	1.471	1.441	1.429	1.580	1.593
53	1.976	1.825	1.561	1.534	1.423	1.618	1.613
54	1.735	1.779	1.649	1.447	1.477	1.676	1.671
55	1.770	1.337	1.804	1.603	1.486	1.787	1.659
56	2.030	1.599	1.834	1.665	1.605	1.762	1.675
57	2.149	1.507	1.829	1.819	1.602	1.907	1.739
58	1.800	1.568	1.990	1.736	1.629	1.729	1.764
59	2.021	1.707	2.113	1.897	1.770	1.975	1.943
60	1.940	1.616	2.146	1.937	1.918	2.101	1.905
61	2.112	1.580	2.299	1.970	1.959	1.963	1.998
62	2.237	1.755	2.318	2.134	2.030	2.081	2.067
63	2.464	1.764	2.335	2.261	2.172	2.160	2.193
64	2.367	1.885	2.674	2.287	2.182	2.233	2.345
65	2.556	1.732	2.827	2.328	2.396	2.380	2.545
66	2.419	1.413	2.676	2.595	2.309	2.227	2.499
67	2.486	1.745	2.869	2.524	2.316	2.436	2.651
68	2.717	1.975	2.735	2.638	2.678	2.376	2.826
69	2.632	1.912	2.926	3.125	2.691	2.595	3.062
70	3.171	2.073	3.199	3.134	3.026	2.473	3.481
71	2.900	2.358	3.260	3.008	2.895	2.520	3.483
72	2.836	2.102	3.399	3.394	3.071	2.727	3.750

ASSESSMENT INDICES

	East Boston (Dist. 1)	Charles-town (Dist. 2)	South Boston (Dist. 3)	Central/ North End (Dist. 4)	Back Bay/ Beacon Hill (Dist. 5)	South End (Dist. 6)	Fenway/ Kenmore (Dist. 7)	Allston/ Brighton (Dist. 8)
46	1.	1.	1.	1.	1.	1.	1.	1.
47	1.000	.920	.936	.944	1.035	.971	1.050	1.067
48	1.003	.963	1.000	1.213	1.003	1.002	1.066	1.097
49	.974	1.107	.966	1.386	1.056	.999	1.040	1.044
50	1.010	.940	.998	1.072	1.010	1.045	1.048	1.054
51	1.012	.991	1.003	1.061	1.083	1.052	1.065	1.076
52	1.001	1.020	.995	1.331	1.077	1.042	1.055	1.066
53	1.012	.926	1.002	1.175	1.065	1.066	1.134	1.074
54	.948	.909	1.022	1.331	1.125	.964	1.046	1.066
55	.998	1.004	1.000	1.215	1.100	1.037	1.092	1.076
56	1.019	.935	1.055	1.129	1.136	1.041	1.051	1.099
57	1.016	1.090	1.032	1.040	1.173	1.029	1.096	1.084
58	.984	.971	1.010	1.258	1.274	1.118	1.060	1.096
59	1.011	.983	1.035	1.154	1.224	.758	1.105	1.136
60	.967	1.043	1.046	1.241	1.229	1.044	1.088	1.063
61	1.051	1.063	1.011	1.189	1.274	1.089	1.040	1.090
62	1.005	.991	1.052	1.138	1.270	1.005	1.078	1.092
63	1.040	.961	1.058	1.126	1.294	1.025	1.126	1.100
64	.999	1.001	1.058	1.406	1.353	1.047	1.137	1.966
65	1.038	1.034	1.022	1.324	1.366	1.039	1.152	1.101
66	1.011	.973	1.088	1.193	1.487	1.065	1.113	1.099
67	1.021	1.002	1.031	1.333	1.515	1.024	1.174	1.099
68	.994	.983	1.058	1.332	1.467	1.149	1.239	1.098
69	1.029	1.028	1.162	1.470	1.530	1.137	1.225	1.122
70	1.027	.986	1.039	1.433	1.368	1.216	1.293	1.173
71	1.083	1.008	1.099	1.432	1.563	1.259	1.583	1.076
72	1.147	.982	1.088	1.418	1.545	1.158	1.217	1.096

ASSESSMENT INDICES

	Jamaica Plain (Dist. 9)	Washington Park (Dist. 10)	Roslindale (Dist. 12)	West Roxbury (Dist. 13)	Hyde Park (Dist. 14)	Dorchester (Dist. 11)	All Boston
46	1.	1.	1.	1.	1.	1.	
47	.977	.980	.995	1.031	.974	.997	.996
48	1.079	1.018	.997	1.031	1.050	.999	1.032
49	1.024	1.005	.985	1.002	1.027	1.000	1.028
50	1.038	1.020	1.003	.988	1.073	1.005	1.023
51	1.034	1.000	.998	.981	1.043	1.003	1.027
52	1.054	1.032	.999	1.012	1.058	1.001	1.042
53	1.072	1.039	1.008	1.026	1.053	1.000	1.044
54	1.023	.983	.958	1.017	1.066	.981	1.020
55	1.028	.974	1.006	1.028	1.085	.985	1.031
56	1.024	.969	1.000	1.021	1.054	1.023	1.037
57	1.028	1.041	.990	1.051	.949	1.008	1.042
58	1.016	.986	.987	.981	1.065	1.017	1.052
59	.988	1.048	.982	1.025	1.074	1.017	1.031
60	1.037	.877	.995	1.005	1.080	1.007	1.031
61	.970	.950	.979	1.040	1.074	1.024	1.047
62	.997	.956	1.000	1.022	1.074	1.006	1.037
63	.996	.952	.997	1.041	1.099	1.038	1.052
64	.988	.943	1.005	1.054	1.071	1.027	1.064
65	1.016	.961	1.004	1.099	1.089	1.040	1.071
66	.989	.986	.997	1.048	1.099	1.034	1.072
67	.960	.947	.981	1.147	1.124	1.027	1.072
68	1.010	.901	1.030	1.073	1.105	1.020	1.079
69	.995	.902	1.011	1.084	1.104	1.042	1.101
70	1.007	.872	1.022	1.138	1.111	1.036	1.097
71	.995	.837	.986	1.126	1.114	1.051	1.123
72	.990	.872	1.071	1.079	1.114	.996	1.089

APPENDIX B

ASSESSMENT - SALES RATIOS

	East Boston (Dist. 1)	Charles-town (Dist. 2)	South Boston (Dist. 3)	Central/ North End (Dist. 4)	Back Bay/ Beacon Hill (Dist. 5)	South End (Dist. 6)	Fenway/ Kenmore (Dist. 7)	Allston/ Brighton (Dist. 8)
46	0.797	1.049	0.944	1.096	0.949	1.612	0.975	0.814
47	0.659	0.793	0.785	1.098	0.777	0.801	1.023	0.684
48	0.562	0.849	0.755	0.674	0.679	0.877	0.791	0.605
49	0.620	0.736	0.486	1.040	0.767	1.120	0.842	0.704
50	0.632	0.984	0.519	0.820	0.621	0.882	0.790	0.494
51	0.478	0.723	0.592	0.776	0.708	0.836	0.699	0.537
52	0.442	0.608	0.592	0.886	0.667	0.550	0.866	0.491
53	0.627	0.582	0.485	0.757	0.769	0.662	0.707	0.573
54	0.426	0.612	0.595	0.833	0.656	0.866	0.709	0.586
55	0.464	0.603	0.485	0.754	0.690	0.611	0.669	0.493
56	0.475	0.478	0.588	0.845	0.659	0.767	0.564	0.489
57	0.464	0.564	0.427	0.446	0.606	0.758	0.553	0.523
58	0.449	0.547	0.409	0.622	0.576	1.333	0.551	0.429
59	0.537	0.518	0.411	0.581	0.566	0.500	0.471	0.435
60	0.423	0.512	0.474	0.449	0.472	0.689	0.528	0.395
61	0.421	0.522	0.362	0.514	0.653	0.703	0.541	0.425
62	0.466	0.509	0.497	0.388	0.430	0.690	0.442	0.368
63	0.408	0.488	0.408	0.451	0.401	0.698	0.376	0.363
64	0.378	0.461	0.440	0.850	0.317	0.547	0.396	0.350
65	0.434	0.375	0.461	0.373	0.366	0.454	0.360	0.322
66	0.387	0.286	0.333	0.314	0.364	0.461	0.346	0.310
67	0.498	0.333	0.416	0.357	0.336	0.379	0.250	0.319
68	0.305	0.303	0.363	0.403	0.309	0.369	0.383	0.279
69	0.347	0.296	0.404	0.309	0.297	0.297	0.305	0.223
70	0.365	0.221	0.304	0.234	0.250	0.267	0.293	0.267
71	0.283	0.233	0.291	0.245	0.279	0.234	0.238	0.220
72	0.261	0.139	0.208	0.266	0.332	0.306	0.293	0.225

APPENDIX B

ASSESSMENT - SALES RATIOS

	Jamaica Plain (Dist. 9)	Washington Park (Dist. 10)	Dorchester (Dist. 11)	Roslindale (Dist. 12)	West Roxbury (Dist. 13)	Hyde Park (Dist. 14)	All Boston
946	0.821	1.193	0.828	0.739	0.598	0.620	0.960414
47	0.766	1.041	0.690	0.629	0.473	0.489	0.781333
48	0.602	1.036	0.592	0.562	0.456	0.642	0.708468
49	0.655	0.810	0.586	0.561	0.503	0.432	0.712814
50	0.649	0.701	0.640	0.578	0.424	0.451	0.655061
51	0.537	0.800	0.598	0.477	0.485	0.492	0.637411
52	0.604	0.717	0.488	0.492	0.396	0.393	0.581614
53	0.498	0.619	0.543	0.453	0.368	0.466	0.584183
54	0.480	0.571	0.582	0.491	0.413	0.401	0.596787
55	0.557	0.664	0.485	0.420	0.369	0.384	0.550129
56	0.521	0.580	0.469	0.412	0.358	0.364	0.544296
57	0.476	0.711	0.452	0.374	0.387	0.304	0.526539
58	0.508	0.595	0.423	0.367	0.325	0.322	0.550180
59	0.482	0.653	0.488	0.364	0.331	0.348	0.494748
60	0.470	0.569	0.424	0.365	0.314	0.318	0.471446
61	0.513	0.669	0.403	0.326	0.318	0.299	0.492002
62	0.431	0.578	0.413	0.344	0.317	0.311	0.457809
63	0.458	0.753	0.399	0.342	0.290	0.303	0.466080
64	0.448	0.606	0.387	0.283	0.286	0.276	0.438175
65	0.411	0.593	0.362	0.303	0.261	0.262	0.400803
66	0.360	0.718	0.394	0.287	0.270	0.263	0.402567
67	0.347	0.556	0.357	0.284	0.284	0.254	0.374110
68	0.397	0.557	0.414	0.272	0.254	0.231	0.374888
69	0.354	0.644	0.324	0.269	0.245	0.242	0.349277
70	0.305	0.491	0.355	0.253	0.229	0.206	0.317748
71	0.316	0.355	0.309	0.242	0.219	0.218	0.277238
72	0.316	0.464	0.283	0.226	0.207	0.206	0.289979

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NOV 05 '76
DEC 20 '76
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~~JUL 25 '77~~
[illegible] 27 '77
MAR 22 '78
~~MAY 2 '78~~
AUG 31 '78
MAY 12 '79
JAN 04 1980

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